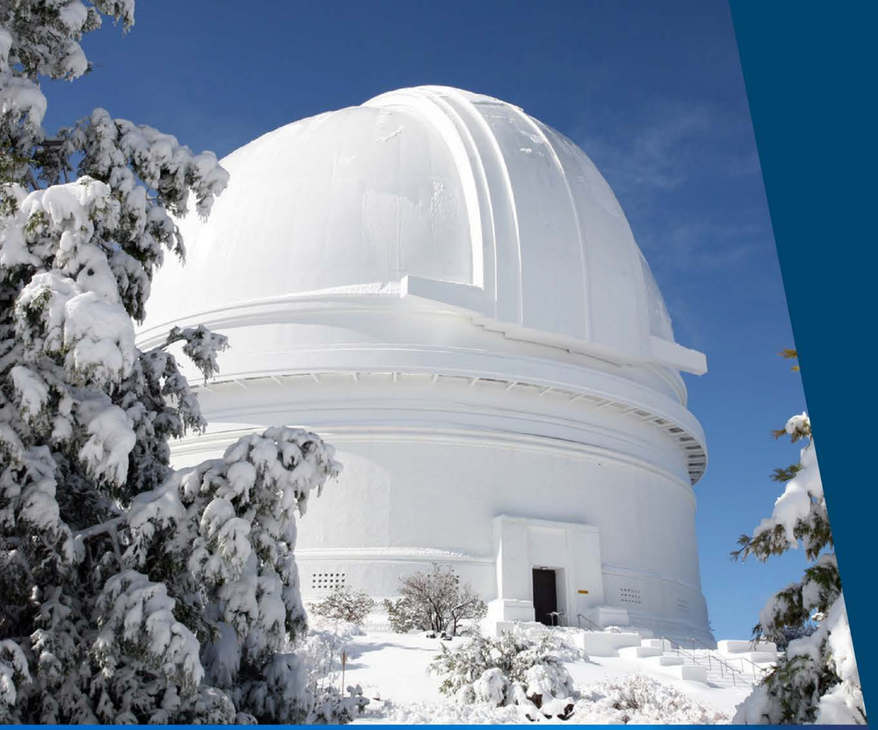

GRADUATE PROGRAM IN ASTRONOMY AT
Yale

Why Yale Astronomy for your Ph.D.?

Plenty of resources for research and a supportive intellectual community

Yale *Astronomy*



ACCESS TO WORLD-CLASS OBSERVING FACILITIES

We have excellent resources for observing, including on-campus observing facilities and telescope-time reserved specifically for our department members.

- Keck: 24 nights per year
- Palomar; 1/8 share
- SDSS V: full partnership

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EASY-ACCESS HIGH PERFORMANCE COMPUTING FACILITIES

The Yale Center for Research Computing (YCRC) provides HPC resources freely available for all students to use.

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GUARANTEED FUNDING

Teaching beyond the University requirements is optional to earn some extra cash, but your main funding as a researcher is secure for 5-6 years.

SUPPORTIVE COMMUNITY

A fun and supportive graduate student community. Class of ~4-5 students admitted each year, and a total of ~25-30 students in the entire program.

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A WIDE RANGE OF RESEARCH INTERESTS ACROSS FACULTY MEMBERS

For listing of faculty by research interest see: https://astronomy.yale.edu/research

EXOPLANETS

GALAXY EVOLUTION

COSMOLOGY

STAR FORMATION

SOLAR AND STELLAR ASTROPHYSICS

...AND MORE

Students complete 2 short research projects in their first two years *before* beginning PhD research. This allows for a fuller exploration of research opportunities.

STRUCTURE OF THE GRADUATE PROGRAM

FIRST 2 YEARS

- 10 courses + 2 research projects (1 observational / experimental, 1 theory)
- 4 Semesters as Teaching Assistant (required)
- 1 Professional Development Seminar (taught every semester during PhD)

END OF 2ND YEAR

Ph.D. Qualifying Exam

Oral exam on proposed PhD project and 3 courses related to thesis, selected by student and advisor.

YEARS 3+

- PhD research
- Yearly progress committee meetings, dissertation progress reports

Goal for completing PhD: no more than 6 years

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ORGANIZATION OF ASTRONOMY AT YALE

- **Astronomy Department** - Kline Tower
- **Physics Department** - Sloan, Wright Lab, and Kline Tower
- **Yale Center for Astronomy and Astrophysics** - Kline Tower (institute bridges activity between Astronomy & Physics depts)
- **Earth & Planetary Science Department** - Kline Geology Lab (interdisciplinary activity in planets and exoplanets)

RESEARCH AREAS OF YALE FACULTY

observer | theorist | instrumentalist

Exoplanets	-	Greg Laughlin, Malena Rice
Sun, Stellar Structure & Evolution	-	Sarbani Basu
Stellar Populations, Galactic Structure	-	Bob Zinn
Star Formation	-	Héctor Arce
Black Holes & X-Ray Binaries	-	Charles Bailyn
Galaxy Structure, Formation & Evolution	-	Jeff Kenney, Marla Geha, Pieter van Dokkum, Frank van den Bosch
Active Galactic Nuclei	-	Meg Urry, Paolo Coppi
Cosmology: Dark Matter, Lensing	-	Priya Natarajan
Clusters	-	Daisuke Nagai
Large-Scale Structure	-	Nikhil Padmanabhan, Laura Newburgh
Astroparticles (Dark Matter, Neutrinos)	-	Reina Maruyama
Instrumentation	-	Andy Szymkowiak
Data Intensive Astrophysics	-	Earl Bellinger

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https://astronomy.yale.edu/people/faculty

ASTRONOMY GRADUATE COURSES

CORE (REQUIRED):

- Astro 500 The Physics of Astrophysics (usually in first year)
- Astro 520 Computational Methods
- Astro 555 Observational Astronomy
- Astro 560 ISM & Star Formation
- Astro 580 Research (taken twice – for each of the 2 research projects)
- Astro 710 Professional Seminar (required every semester)
- Phys 590 Responsible Research by the Physical Scientist (ONCE)

SEMI-CORE (MUST TAKE ONE OR THE OTHER):

- Astro 530 Galaxies OR Astro 565 The Evolving Universe
- Astro 510 Stellar Populations OR Astro 550 Stellar Astrophysics

ELECTIVES (ALL OTHER COURSES):

- Examples: Astrophysical Flows, Exoplanets, Radio Astronomy, High-Energy Astrophysics, Stellar Dynamics, Galaxy Formation, Cosmology, Advanced Statistical Methods for Astronomy

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RESEARCH PROJECTS

ALL STUDENTS CARRY OUT TWO RESEARCH PROJECTS IN THEIR FIRST TWO YEARS:

1 observational (data-based), 1 theory (model-based)

Good plan:

- for 1st project: start in 1st semester, finish in 2nd semester or summer
  (take for credit as A580 in 2nd semester)
- for 2nd project start in summer or 3rd semester, finish in 3rd or 4th semester
  (take for credit as A580 in 3rd or 4th semester)

The goal is to have at least one of the 2 research projects result in a published paper

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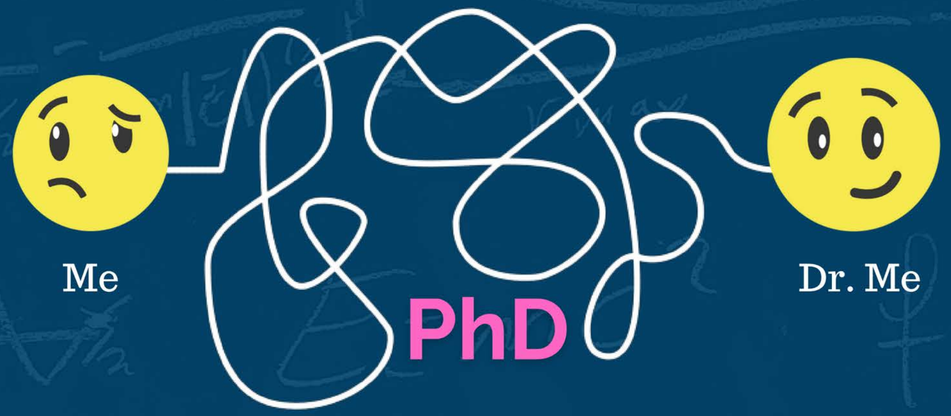
PhD QUALIFYING EXAM

Taken at end of 2nd year (2nd summer)
Prepare during 4th semester/summer
(student may opt TA 3rd year,
instead of 4th semester)



QUALIFYING EXAM IS A TWO-PART ORAL EXAM:

1. Oral exam on proposed PhD Project
2. Oral exam on 3 courses* (relevant to thesis work) to test mastery of material.

*3 courses chosen by Student + Advisor and approved by DGS.

Students will get a second chance if they don't pass one of the parts

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CURRENT WEEKLY ASTRONOMY EVENTS

Weekly activities are open to all department members

Astronomy Colloquium

Galaxy Lunch

Cosmology Seminar

Exoplanets and Stars Seminar

Data Science x Astro Seminar
(bi-weekly)

Software Journal Club

Also:
Public Night at LFOP - Tuesday evenings
Astronomy Happy Hour (AHH) - Friday afternoons

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STUDENT INVOLVEMENT IN DEPARTMENT AFFAIRS

- Astronomy Climate and Diversity Committee (ACDC) https://astronomy.yale.edu/about/climate-and-diversity
- Astronomy Student Council (ASC) https://astronomy.yale.edu/resources/astronomy-student-council
- Student representatives on Telescope Time Allocation Committee (TAC)
- Voice opinion on curriculum, climate, other issues through surveys and meetings
- Mentorship of undergraduate students (Astro sibs)
- Outreach (Leitner Family Observatory & Planitarium, and more)

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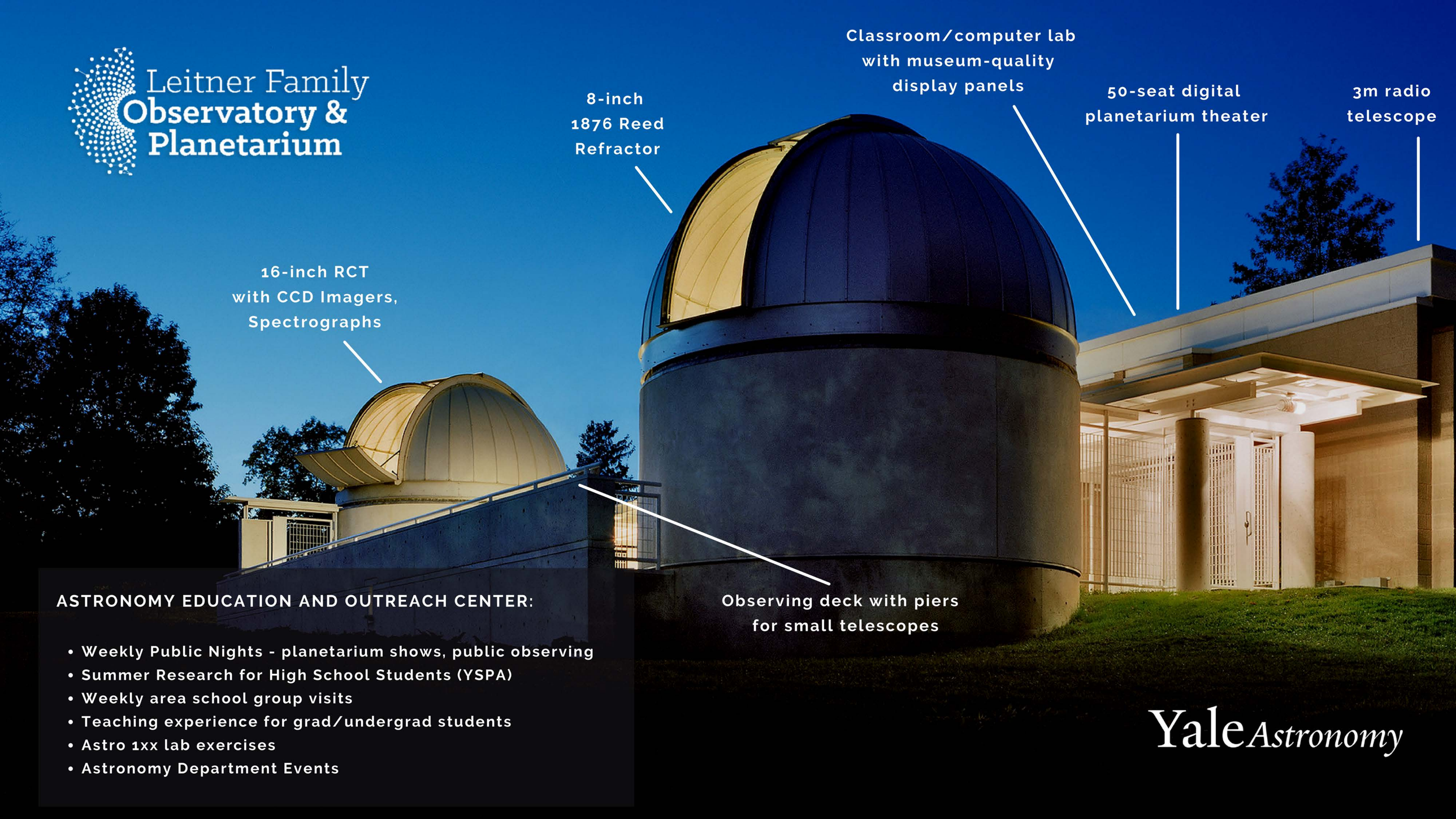
Leitner Family
Observatory &
Planetarium
8-inch
1876 Reed
Refractor
Classroom/computer lab
with museum-quality
display panels
50-seat digital
planetarium theater
3m radio
telescope
16-inch RCT
with CCD Imagers,
Spectrographs
Observing deck with piers
for small telescopes
ASTRONOMY EDUCATION AND OUTREACH CENTER:
• Weekly Public Nights - planetarium shows, public observing
• Summer Research for High School Students (YSPA)
• Weekly area school group visits
• Teaching experience for grad/undergrad students
• Astro 1xx lab exercises
• Astronomy Department Events
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STUDENT INVOLVEMENT AT THE GRADUATE SCHOOL & UNIVERSITY LEVEL

- Graduate Student Assembly **https://gsa.yale.edu**
- GSAS Graduate Student Development and Diversity (OGSDD) Fellows **https://gsas.yale.edu/diversity/office-graduate-student-development-diversity/ogsdd-fellows-program-application**

TEACHING FELLOW PROGRAM

Learning to teach is important part of graduate student training

Teaching requirement: 4 semesters total
(typically 2 TF10's (6-10 hrs/wk) and 2 TF20's (15-20 hrs/wk))

During a semester, a TF may have ~6-15 hrs/week
usually done in first 3 semesters, plus sometime in year 3+ (4th semester -- prepare for qualifying exams)

- Can do more than 4 semesters for extra money
- Can do courses outside of Astronomy to meet requirement
- Can teach in summer for extra money (but does not fulfill teaching requirement)

Students can have higher level teaching experience thorough programs offered at the Poorvu Center for Teaching and Learning (see next slide)

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POORVU CENTER FOR TEACHING AND LEARNING

PROGRAMS FOR GRAD STUDENTS INCLUDE:

- **Teaching development, workshops, programs and grants:**
  - Certificate of College Teaching Preparation (CCTP)

(comprehensive training program in effective college teaching)

  - Associates in Teaching Program

(student works in cooperation with faculty to redesign, plan and deliver undergraduate course)

  - Teaching Innovation Project Grants Program

- **Writing Lab**
  - Individual writing consultations
  - Workshops, seminar and panels on written and oral comm.
  - Writing peer-review groups
  - Writing retreats and study halls

https://poorvucenter.yale.edu/

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OTHER (UNIVERSITY-WIDE) RESOURCES:

Office for Graduate Student Development and Diversity (OGSDD)
– Mentoring + Advising, social + professional development events, workshop + lectures of interest to graduate students

McDougal Graduate Student Center
– Support Resources, Social Events, Community Building

Schwarzman Center
– Center for student life and art (for all Yale students)

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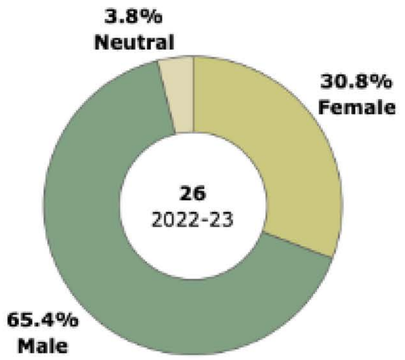
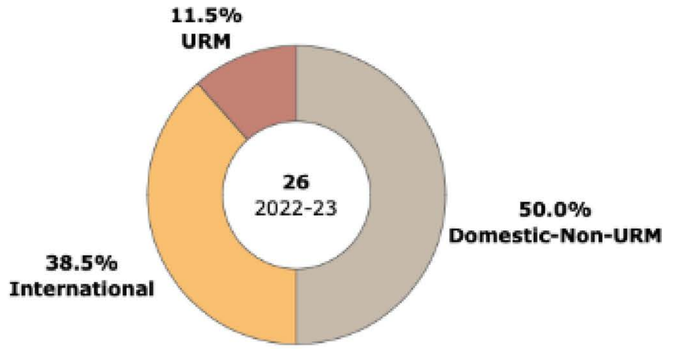
YALE ASTRONOMY STATISTICS

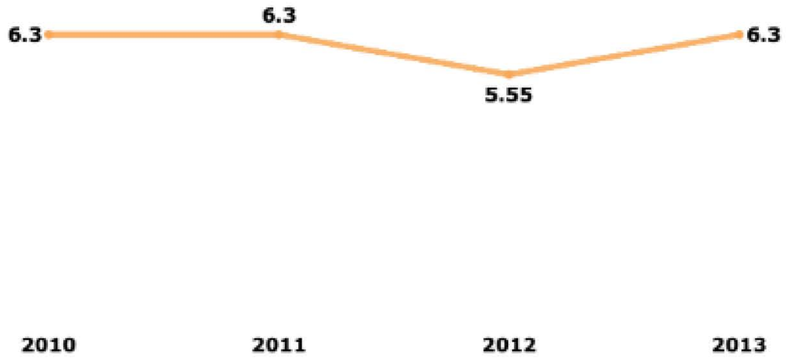
Enrolled Students by Gender as of October 2022



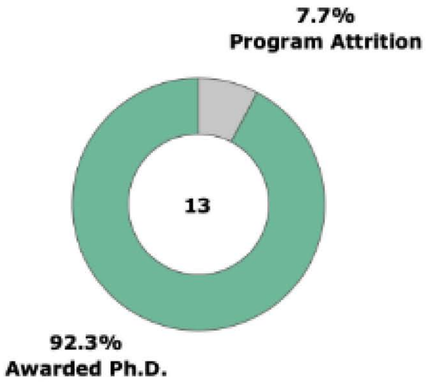
Enrolled Students by Citizenship and Under Represented Status as of October 2022



Median Calendar Years until Degree



Completion Rate for Students Entering from 2009 to 2010 through 2012 to 2013



See more at: https://gsas.yale.edu/admissions/phdmasters-application-process/program-statistics

PLEASE COME JOIN US!

- Are you curious to learn and figure things out?
- Do you have desire for mastery and for learning new ways of problem-solving?
- Do you have core competence in foundational material – physics and mathematics?
- Have you had exposure to research methods and experience with research project, if opportunities were available?
- Do you have the capacity to deal with the ups and downs that are part of long-term intellectual learning?
- Do you have enthusiasm for research?
- Are you excited to belong to a scientific community working on cutting-edge problems?

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FOR MORE INFORMATION....

VISIT OUR WEBSITE AT:
ASTRONOMY.YALE.EDU

https://www.facebook.com/YaleAstro

https://www.instagram.com/yaleastronomy/